Mike:
will respond
to 5(c)
Comment

ARCADIS

ARCADIS G&M Inc
6 Terry Drive
Suite 300
Newtown
Pennsylvania 18940
Tel 267 685 1800
Fax 267 685 1800
www.arcadis-us.com

ENVIRONMENT

H. Thomas Fridirici, P.G.
Water Supply Management Program
Pennsylvania Department of Environmental Protection
909 Elmerton Avenue
Harrisburg, Pennsylvania 17110-8200

Subject
Aquifer Pumping Test Plan, Proposed Bally Public Water System Supply Well, Berks County, Pennsylvania

Date
17 August 2005

Contact
Christopher Sharpe

Phone
267.685.1800

Email
csharpe@arcadis-us.com

Our ref
NP000597.0002.00016

Dear Mr. Fridirici:

This letter outlines the proposed methodology for conducting the constant flow rate aquifer pumping test required by the Pennsylvania Department of Environmental Protection (PADEP) as part of the permitting process for a new groundwater community water source. This plan is being presented to the PADEP to ensure that the PADEP understands ARCADIS' proposed aquifer pumping test (test) methodology, and to ensure PADEP's concurrence with these methods. In addition, this letter addresses the comments to the Pre-Drilling Plan Addenda provided in PADEP's July 13, 2005 correspondence.

Locations

The aquifer pumping test will be conducted on the proposed supply well located in Washington Township, Berks County, Pennsylvania. The proposed well location is presented on Figure 1. As shown the location is a rural agricultural area. A previously drilled six-inch diameter pilot boring located north of the Borough of Bally near Route 100 is the intended site for the proposed final production well. The intended location is at an elevation of approximately 470 feet above mean sea level (MSL) (Figure 1).

Protection

Based upon the target yield of the well (350 gallons per minute (gpm)), geology (karst carbonate) and open interval (>200 ft), the expected well head protection area (WHPA) is expected to have a radius of 135 feet. Should the well meet the requirements for a community water supply well as published by PADEP, control over the Zone One WHPA area will be secured. Proof of this control will be presented in the hydrogeologic report.

Hydrogeology

The pilot boring (MW-1) has been completed in the Leithsville Formation. The Leithsville Formation is composed of dark grey crystalline dolomite, the upper portions of which are rich in shale at some locations. The geology in the vicinity of the proposed well is composed of dolomite, gneiss and quartzite clasts in a clayey soil matrix to a depth of approximately 140 feet. Approximately 20 feet of weathered bedrock is present above the competent bedrock surface. **The total depth of the pilot boring was 380 feet.** A major water bearing zone was present between 330 and 370 feet below land surface. Ambient depth to water in MW-1 currently is approximately 27 feet below ground surface.

Well Completion

Prior to conducting the aquifer test, a production well conforming to American Water Works Association (AWWA) specifications will be constructed at a diameter of eight inches. The production well will be constructed by converting the pilot boring or by drilling a new borehole near the location of the existing pilot boring. The pilot boring will remain in place at least until the final pumping test is completed. The casing for the production well will be equipped with a steel drive shoe and driven 10 feet into competent bedrock. Centralizers will be used to ensure that the annular space is consistent on all sides of the casing. The casing will be grouted from bottom to top in one lift, with grout emplaced under pressure via a tremie.

Pump Type and Setting

A submersible pump will be used for the aquifer pumping test. The pump will have the capacity to produce a constant flow rate between 300 and 400 gpm and will be set in the production well at the deepest high-productivity zone encountered during the drilling of the well. This will maximize yield by maximizing the available drawdown, resulting in the most representative water quality samples to be collected at the end of the test.

Test Duration

The duration of the aquifer pumping test will be at least 48 hours as required by the PADEP and Delaware River Basin Commission (DRBC). Prior conversations with the PADEP and DRBC have confirmed that a 48-hour test should be sufficient for the proposed pumping locations. Additionally, recovery data will be collected using data loggers after the pumping and sampling phases are complete.

Monitoring

Discharge Rate

During the pumping test, the well discharge rate will be monitored using a flow meter. Valves will be provided at the location of the flow meter to provide discharge rate control and a means of sampling the well. Monitoring of the discharge rate will permit a more accurate analysis to be performed on the results of the aquifer test in the event that irregularities occur in the discharge during the course of the test. Flow will be monitored as frequently as possible and recorded on 60 minute intervals at a minimum.

Water-Level Drawdown

During the aquifer pumping test, water levels will be monitored in the test well, monitoring wells, residential wells and other relevant points to determine whether the proposed well influences nearby wells or surface water. **The existing pilot well, if not converted to the production well, will be monitored during the aquifer test.** Additionally, three new monitoring wells will be installed for the test providing a total of three wells on the 40 acre parcel, in addition to the production well. Piezometers will be installed to the north, south and east of the production well. The monitoring points are shown on Figure 1. Monitoring Well 2 (MW-2) will be installed approximately due south of the pilot boring, as close to the southern corner of the property as the conditions at the time of drilling will allow. Monitoring Well 3 (MW-3) will be located approximately 600 feet to the northeast approximately the same distance from Route 100 as the pilot boring. A fourth monitoring well (MW-4) will be installed to the southwest, approximately 1,860 feet from the pumping well, near the edge of the Borough of Bally.

These wells will be constructed to monitor the same zone as the zone that the production well is completed in. Wells will be constructed as steel-cased, open rock wells to target depths of the planned production well (approximately 400 ft.).

Additional shallow existing wells will also be monitored: Municipal Well 1, Well 87-8I and residential wells. A meeting was held on August 10, 2005 with four residents whose properties are adjacent to the parcel in which the proposed supply well is located. All four residents have agreed to provide access to their property for monitoring during the test. Three of these residents have wells that, if accessible, will be monitored during the test. The water for the fourth resident is obtained from a spring that, if accessible, will be monitored during the test. Additionally, other residential wells will be monitored during the test if access is obtained. ARCADIS

will provide a list of residents with contact information under separate cover when PADEP is notified of the actual start date of the test.

Data collected from the observation wells will allow the calculation of the transmissivity and storage coefficient of the aquifer.

Monitoring of water levels in the test and observation wells will be conducted using pressure transducers to collect time-drawdown data. The pressure transducers collect digital data that can be used to analyze the results of the aquifer test. The pressure transducers will be set to record data at a logarithmically increasing interval. The interval for the test well and observation well(s) will start with an interval of approximately one half second and progress to approximately fifteen-minute intervals. **Background data will be collected for approximately four weeks prior to the test and approximately four weeks following the test.**

Surface Water and Wetlands

Nearby surface-water bodies will be monitored to determine the influence, if any, of groundwater pumping. The nearest stream is an unnamed tributary to Perkiomen creek classified as TSF by PADEP. Monitoring of surface water and wetlands near the proposed well will be conducted using temporary piezometers. The piezometers will be installed to the north, south and east of the production well. The piezometers will be paired such that the screened interval of one extends across the normal standing water level of the wetland and a deeper one is screened across the water table in the vicinity of the surface water body. Piezometers will be monitored by hand approximately hourly during the first 6 hours of the test and at a reduced frequency (to be determined based upon field observations) thereafter.

The piezometer may be instrumented with a pressure transducer to monitor the water level in the wetlands during the pumping test. **Approximately one week of background data will be collected at surface water monitoring points prior to the start of the aquifer pumping test.**

Climatic Data

Climatic data will also be monitored before and during the aquifer test. Data collected will include precipitation and barometric pressure. Monitoring of climatic data provides the ability to compensate for changes in ground and surface water levels because of precipitation or changes in barometric pressure. During the test an onsite rain gauge will be used to quantify precipitation occurring during the pumping period. Data for the period preceding and following the test will be obtained from the nearest available local weather station. The nearest climatic data station is

located in Palm, Pennsylvania approximately seven miles northeast of Bally. The data are available online from the National Climatic Data Center (NCDC).

Water Discharge

Water produced during the aquifer pumping test will be handled in accordance with the requirements of the Berks County Conservation District (BCCD). Present data indicate that the water produced by the well will not pose an issue with regard to suspended sediment. As such, water will be discharged directly to the nearby stream using proper erosion control techniques. Water will be discharged to a point downstream of any surface water monitoring points. The distance from the test location to discharge point is approximately 400 feet. The discharge location is shown on Figure 2.

Sampling and Analysis

At the conclusion of the aquifer pumping test, water samples will be collected to assess the quality of the water produced by the well. The samples will be analyzed according to the requirements outlined in the most recent version of the Community and Non-Transient Non-Community Water Systems New Source Sampling Requirements for Groundwater Sources including Microscopic Particulates Analysis (MPA), as published by the PADEP. Samples will be sent to laboratories identified on the List of Commercial Certified Drinking Water Laboratories obtained from the PADEP Office of Water Management website. A full set of duplicate samples will be collected in case any of the samples are broken during shipping; however only one set is required for analysis.

The hydrogeological data collected from the production and observation wells (drawdown and discharge changes with respect to time) during the aquifer pumping test will be analyzed to determine the hydrogeological properties of the formation. The specific method(s) used to analyze the hydrogeological data (e.g. Theis, Cooper-Jacob, etc.) will be selected after the data have been collected and reviewed. Test data will be analyzed with Aqtesolv. Laboratory analytical data from the samples collected at the conclusion of the test will be used to define the quality of water produced by the well.

Follow up

Upon the completion of the aquifer test analysis a hydrogeologic report will be prepared and submitted with the well permit application, per PADEP requirements.

If you have any questions or comments regarding this plan, please contact us as soon as possible.

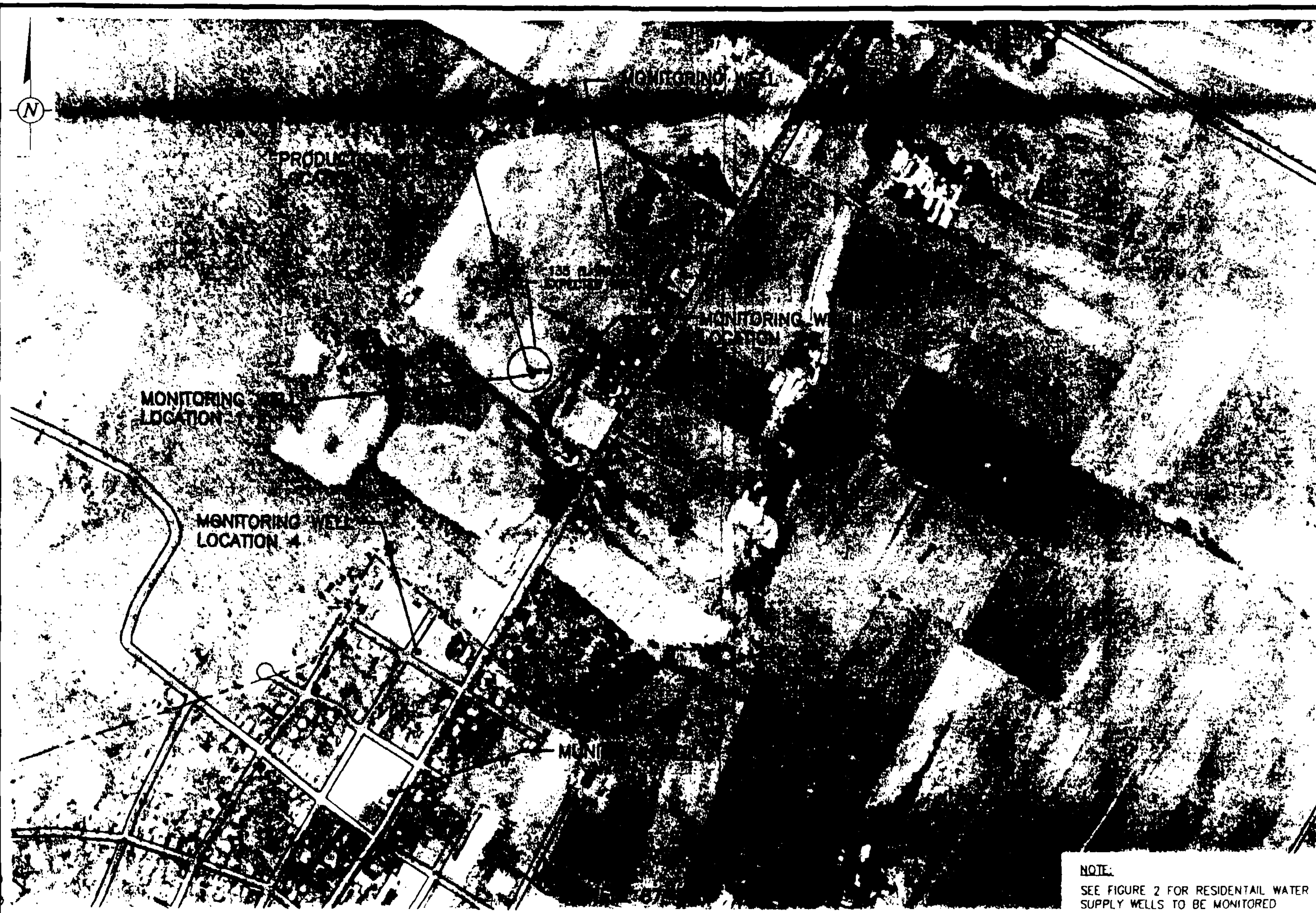
Sincerely,

ARCADIS G&M, Inc.

Christopher T. Sharpe
Staff Geologist

Eric Schmidley, P.G.
Senior Hydrogeologist

Copies
L. Borland
C.A. Gahagan
M. Bedard
M. Cron
T. Hermerka
G. Unger

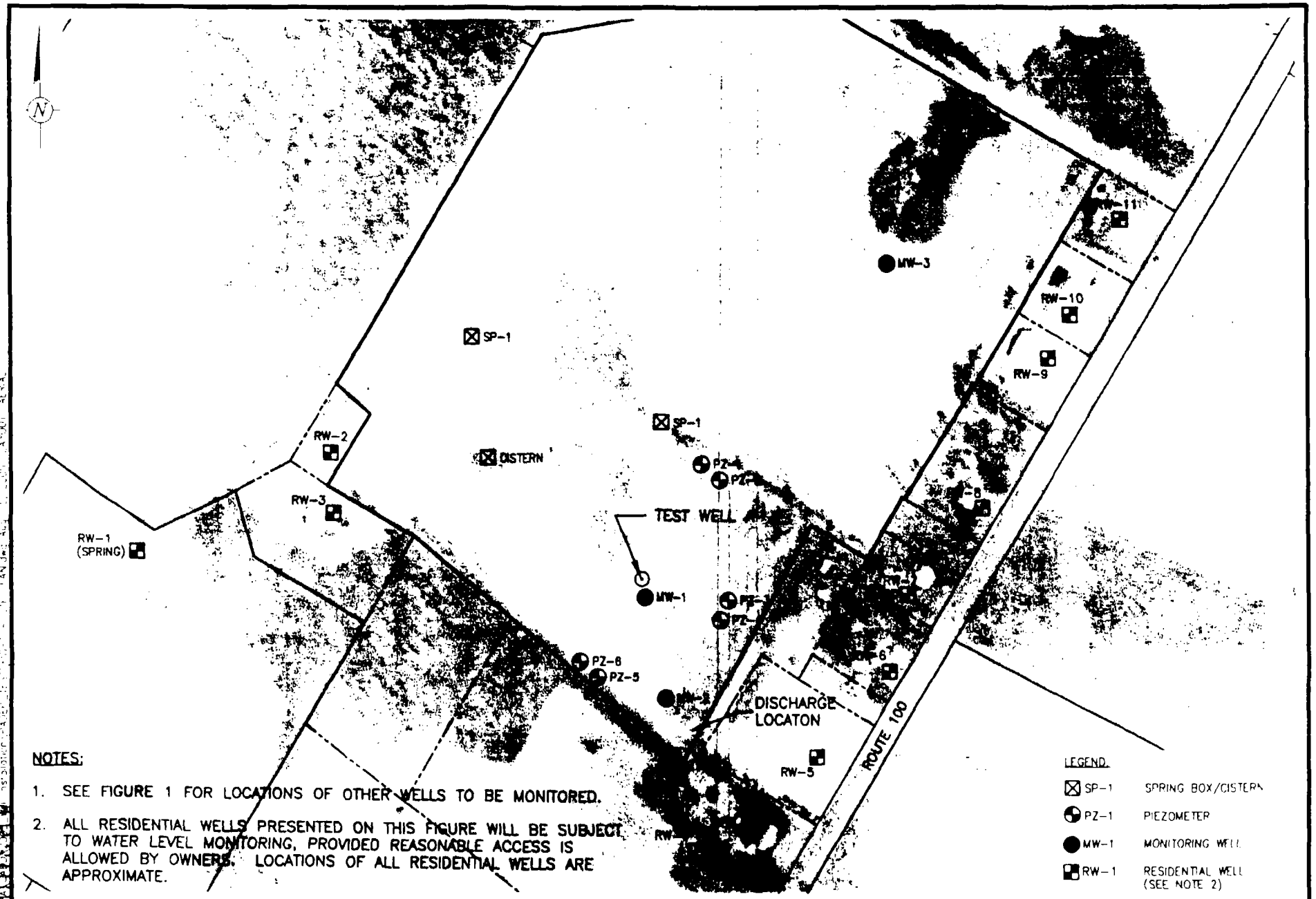


NOTE:
SEE FIGURE 2 FOR RESIDENTAIL WATER SUPPLY WELLS TO BE MONITORED

0 800
SCALE: 1"=800'

ARCADIS

DRAWN M. WASILEWSKI	DATE 8/15/05	PROJECT MANAGER M. BEDARD	DEPARTMENT MANAGER A. ROBINSON
PROPOSED WATER SUPPLY WELL LOCATION		LEAD DESIGN PROF. F. LENZO	CHECKED D. McCARTHY
		PROJECT NUMBER NP000597.002	DRAWING NUMBER 1



0 300
SCALE 1"=300'

ARCADIS

DRAWN	DATE	PROJECT MANAGER	DEPARTMENT MANAGER
M. WASILEWSKI	8/15/06	M. BEDARD	A. ROBINSON
		LEAD DESIGN PROF.	CHECKED
		F. LENZO	D. McCARTHY
		PROJECT NUMBER	DRAWING NUMBER
		NP000597.002	2

MONITORED LOCATIONS
AQUIFER PUMPING
TEST BALLY, PA
AUGUST, 2005